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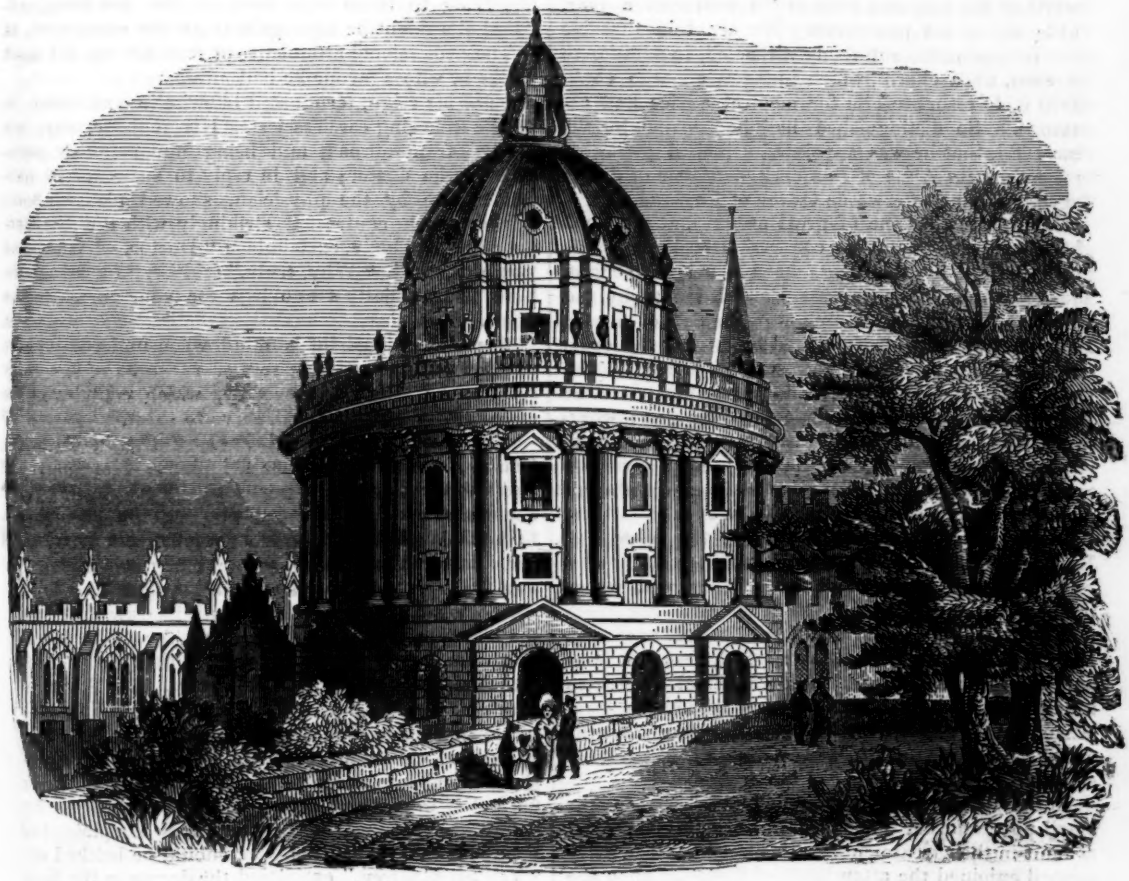
DOCTOR RADCLIFFE, AND THE RADCLIFFE LIBRARY AT OXFORD.



THE RADCLIFFE LIBRARY AT OXFORD.

THE individual, to whom the University of Oxford is indebted for the Repository of Medical Literature, of which we have given a view above, was experienced by his own and the succeeding age, to centre in his own person the skill of the physician with the coarse wit of the buffoon; the parsimony of the miser with the liberality of a prince.

He was born in Yorkshire, in the year 1650; and having received the rudiments of his education at Wakefield and Oxford, and taken his degrees at the latter place, he directed his attention for some years to the study of medicine, and commenced practice in 1679.

DR. JOHN RADCLIFFE stands pre-eminent among the physicians of modern times, for the clearness of his judgment, which led him to perceive the vicious method then in use of treating diseases, and especially the small-pox; and for the courage with which he denounced such method, and applied his own. This, in the case of the small-pox, then a frightful and dangerous disease, was termed the *cooling* treatment. When he began the exercise of his profession at Oxford, the small-pox was raging dreadfully in the city and neighbourhood. He did not hesitate to use the new method of treatment towards all who came under his care. He gave the sick plenty of air, and ordered cooling draughts and lotions; which was a means of saving very many from impending death.

Though the *cooling* method of treatment had been already sanctioned by some distinguished names, such as Sydenham, Locke, &c.; yet, as Dr. Lydal, then the most celebrated practitioner of the University, adhered to the old practice, Radcliffe met with all sorts of opposition and discouragement from the apothecaries of the place, and others connected with the profession: until the evident results of his supe-

rior management of the sick, silenced his opponents, and made them contented to submit to, and receive instructions from him.

The circumstance of his successfully applying the new mode of treatment to Lady Spencer, at Yarnton, a little distance from Oxford, brought him into notice, among the most distinguished people of the country. This lady had been attended for a complication of disorders by Dr. Lydal, and Mr Musgrave of Oxford, without deriving much benefit from their advice. Upon sending for Radcliffe, and submitting to his treatment, she recovered, to the astonishment of all who knew her, and lived many years afterwards.

When he was about thirty-four years old, he removed to London, and rose, in the course of a year, to the top of his profession. We are told that his pleasant discourse, and ready wit, acted, in addition to his skill, as a charm, which induced all who could afford it, to resort to him for medical advice and assistance. So distinguished had he become, by the year 1686, that he was appointed principal physician to the Princess Anne of Denmark, daughter of James the Second, and afterwards Queen of England.

Having thus become of great account, at the court of James the Second, his conversion to Popery was much desired by the king, when the latter sought, about this time, to restore the English monarchy and nation to the spiritual dominion of the See of Rome. Radcliffe was accordingly visited by two of the court chaplains, and by them, and several of his Roman Catholic friends, was solicited to attach himself to the Romish faith, which had made great progress wherever the influence of the Crown reached, and which, it was vainly hoped, was making equal progress throughout the nation at large. To the credit of Radcliffe, he continued true, under all the arts of solicitation and blandishment, to the faith of the Church of England, in which he had been brought up.

When King William and Queen Mary were seated upon the English throne, Radcliffe rendered them many professional services, and was liberally rewarded. In these services he was so successful, that his fame and wealth both increased to a wonderful extent; so much so, that it is related that a neighbouring physician, Dr. Gibbons, received 1000*l.* a year from the overflow of patients who were not able to get admission to the great physician of the day.

In the year 1694 Queen Mary was seized with the small-pox, and her majesty's physicians were found at fault in their treatment of this disorder. The privy council enjoined the attendance of Radcliffe upon the queen, who, looking over the prescriptions already used for the royal patient, bluntly observed, that "her majesty was a dead woman, for it was impossible to do any good in her case, where remedies had been given that were so contrary to the nature of the distemper; yet he would endeavour to do all that lay in him to give her some ease." His method of treating the queen's case gave some hopes of her majesty's recovering; but these vanished, and she soon after died.

A short time after the death of Queen Mary, the doctor, who had been a great favourite of the Princess Anne, lost her patronage and esteem by his flippancy and rudeness, which was the result of his occasional love of drinking. It appears that her royal highness being indisposed, had caused him to be sent for; in answer to which, being then at dinner, he promised to go to St. James's soon after. As he did not make his appearance, a messenger was sent after him, to press his immediate attention, and to describe the nature of the princess's complaint. When he heard the symptoms detailed, he impatiently protested, that "her highness's distemper was nothing but the vapours, and that she was in as good a state of health as any woman breathing, could she but believe it." He was, in consequence of this speech, discharged from his attendance upon the princess, who conceived a violent antipathy towards him ever after; in which she only relaxed, when the urgency of the cases induced her to see him, with a view to the benefit of her dying child, the Duke of Gloucester, heir-apparent to the crown, and of her husband, Prince George of Denmark. Upon the accession of this princess to the throne, Radcliffe was recommended by his friends to the post of principal physician to the queen; but she could never be prevailed upon to receive him, observing to those who proposed the arrangement, "that she might be told again about *'the vapours.'*"

The professional attendance of Radcliffe upon King William, whose favour he had preserved till near the close of his reign, terminated likewise in consequence of the following careless jest. His majesty, having arrived from abroad, and being much indisposed, sent for the doctor; and in reply to some questions put to him by the physician, showed his swollen ankles, which contrasted strikingly with the rest of his emaciated body, exclaiming: "Doctor, what think you of these?" "Why, truly," said he, "I would not have your majesty's two legs for your three kingdoms."

The turn of Radcliffe's mind, when under any excitement, was to a coarse sort of rudeness of expression, as the following anecdote, which contains one out of many instances, will serve to show.

When the doctor lived in Bow Street, Covent Garden, he had for a close neighbour, Sir Godfrey Kneller, the king's chief portrait painter. Their gardens were contiguous, a wall dividing the one from the other. As Sir Godfrey's garden was a very rare and inviting place, owing to the many exotic plants, and the variety of flowers and shrubs abounding in it, the doctor, being very intimate with its owner, desired the liberty of having a door made, for a free intercourse with both gardens; but so as that no inconvenience should result to either family. To this proposal, Sir Godfrey politely acceded: but as the doctor's servants often strolled about in Sir Godfrey's garden, and did much mischief among its productions, constant complaints were made to their master, who took no notice of them; until, at last, he was warned by his neighbour, that, if the grievances complained of were not terminated, the door should be bricked up. "Tell Sir Godfrey," exclaimed the doctor to the footman, who delivered the message, "that he may do what he thinks fit with the door, *provided he do not paint it.*" The man, having delivered this answer to his master, was sent back to the doctor with the following: "Sir Godfrey presents his service, and sends to say, that *he can take any thing from you, but your physic.*"

Without entering into a detail of the many remarkable cures effected through the agency of Radcliffe, in the cases of persons in the highest ranks, it may be sufficient to observe, that though he was no longer admitted at court, his advice was often privately resorted to, during the progress of Queen Anne's illness. In July, 1714, she was seized with that sickness which ended her life. Now it so happened, that at that time, Radcliffe was not in London, but was confined by a fit of the gout at his country-house in Surrey. His enemies (and he probably had many, in consequence of his success, coupled with his unpleasant manners,) accused him of refusing to give his professional advice in the case of his sovereign; and it was even moved in the House of Commons, a

few days after the queen's death, that Radcliffe should be summoned to attend in his place, (for he had been elected to the House for the town of Buckingham,) in order to be censured for his neglect of her majesty. But it appeared subsequently, that neither the queen, nor the privy council, had thought of sending for him, or had even mentioned him; and that he was only sent to by Lady Masham, two hours before the queen's death. The gout had then seized his head and stomach; but he seems to have declined accompanying Lady Masham's messenger, on the ground, that he had not received "proper orders" for attending the queen; and that "her majesty's case was desperate, and her distemper incurable."

Radcliffe died about three months after the queen, in the sixty-fifth year of his age. He is said to have been a free liver, and to have regretted this in the latter part of his life, as having furnished an evil example to many of his bottle-companions. But his death is said to have been hastened by the vexation which he felt, at finding the popular feeling so strong against him, on account of his asserted negligence of the queen, that it was unsafe for him to go abroad. His body lay for some time in state, and was honoured with a public funeral at Oxford.

Besides numerous acts of individual kindness and charity, recorded by his biographers, Dr. Radcliffe spent large sums in behalf of the Society for Promoting Christian Knowledge, at the same time that, we are told, he was always hard and difficult in paying his just debts. He left large property among different institutions; but the bulk of his estates was bequeathed for the use and benefit of the University of Oxford. From money left by him, and the proceeds of his estates, were built the RADCLIFFEAN LIBRARY, the Observatory, and the Infirmary; and likewise aid has been furnished from the same source to many other charitable institutions.

The Library, of which our frontispiece furnishes a view, was planned and built in the course of about ten years. It was opened, with a public ceremony, by the trustees of Dr. Radcliffe's will, in the year 1749.

He left 40,000*l.* specially for the purchase of the ground, and the erection of this library; with 100*l.* per annum, for the purchase of books, and 150*l.* per annum, for the librarian. James Gibbs, of Aberdeen, was the architect. It stands in the centre of a square formed by St. Mary's church, the public schools, and two of the colleges. It is erected upon arcades, which, being circularly disposed, inclose a spacious dome, in the centre of which is the library itself, and into which there is an ascent by a spiral flight of steps. This building is a fine architectural ornament to the city of Oxford, whatever point of view it is seen from. By a late resolution of the trustees, the library has been appropriated to the reception of books on Medicine and Natural History.

IN some unlucky dispositions there is such an envious kind of pride, that they cannot endure that any but themselves should be set forth for excellent; so that when they hear one justly praised, they will either seek to dismount his virtues, or, if they be like a clear light, they will stab him with a *but* of detraction; as if there were something yet so foul as did obnubilate even his brightest glory. When their tongue cannot justly condemn him, they will leave him suspected by their silence.

Surely, if we considered detraction to be bred of envy, and only in deficient minds, we should find that the applauding of virtue would win us far more honour than the seeking slily to disparage it. That would show we loved what we commended; while this tells the world we grudge at what we want in ourselves.—FELTHAM.

THE PENDULUM. III.

THE two remaining papers of this series, will be devoted chiefly to the subject of COMPENSATION Pendulums; and, in order to understand their principle, we must examine a little more particularly, the construction of the common pendulum. It consists of a straight inflexible rod or wire; but as this cannot be suspended so freely and easily as a flexible body, the upper part is made of a piece of thin pliant steel spring, three or four inches long, called the *pendulum spring*; so that the whole can be suspended exactly as if it were entirely composed of string, or any other flexible body. The fixed point, to which the pendulum is attached, is called the *cock* of the pendulum, and consists of a little solid piece of metal with a narrow slit in it, as seen at C in the figure below. The pendulum-spring is drawn through this slit, which is so narrow, that it requires some force to draw the spring up or down through it; but, lest the weight of the pendulum should cause it to shift its place, it is pinched very tightly by a screw D, passing partially through the cock of the pendulum; so that the spring cannot be drawn up or down through the slit, without first relaxing the pressure of this screw. This arrangement is represented in the annexed figure.

Fig. 11.

The lower part of the rod is made to terminate in a screw, it being cut with a spiral thread for three or four inches of its length. On this screw fits a nut A, by turning which in one direction, it is of course raised, and in the other direction, lowered. This has been explained in the last article on the MECHANICAL POWERS; where it was seen that, when the screw is fixed, and the nut moveable, each revolution of the latter moves it lengthwise through a space equal to the distance between any two contiguous parts of the thread. Lastly, there is the heavy bob B, which slides freely up and down the rod; so that it would fall off, were it not supported by the nut A. By turning this nut, therefore, the bob is very slowly and gently raised or lowered at pleasure; and, as the centre of oscillation is situated in the bob, by raising it, we shorten the effective length of the pendulum; and by lowering it, we lengthen the pendulum. It is by this mode that a clock is at any time adjusted after it is made. Of course, it cannot expected, however accurately the pendulum may be constructed, that it should, after being once suspended, continue of exactly that effective length which gives just 86,400 oscillations in the period called a *mean day*. It should here be observed that the time to which clocks are adjusted, is not the same as that indicated by a sun-dial. The latter is called *apparent time*, and the apparent days and hours, as denoted by the course of the sun, are not equal in length throughout the year, owing to the complex motion of the earth. But if a year be divided into 365 equal parts, called *days*, and these again into equal parts called *hours*, this is called *mean time*. The two kinds of time only agree on four days in the year. At all other times they differ, sometimes to the amount of 16¼ minutes. This difference is called the *equation of time;* and is set down in most almanacs for every day in the year.

It is this which constitutes the difference between a sun-dial and an accurate clock or chronometer.

If, therefore, a clock be set to the time shown by a dial, and the equation of time be allowed; and if it be found, on comparing them again on the next day, that they do not keep the proper relation to each other; the screw of the pendulum must be turned a little in the proper direction, and this process must be repeated till the clock goes right.

It will be found that a very slight touch of the screw is sufficient to make a considerable difference in the rate of the clock's going. Thus, if the time of each oscillation be increased by the ten-thousandth part of a second, small as this space appears, it will in a few days produce no trifling difference in the rate of the clock; for, at the end of twenty-four hours only, the clock will have lost more than eight seconds and a half; and, although this is of no consequence in the common uses of a clock, yet in the course of weeks and months, the error will accumulate to such an extent, as to render the clock useless, until it is again regulated. Yet all this error may be produced by a difference in the length of the pendulum, which shall be far too small to be visible to the naked eye.

It appears, then, that, in a good clock or chronometer used for the purpose of astronomy or navigation, the degree of accuracy required in the length of the pendulum is almost inconceiveable. It must, therefore, be of immense importance that the pendulum should remain always ef the same length under all variations of weather or climate, to which it may be exposed. Yet it is known to every novice in science, that all bodies expand by heat, and contract by cold. However small this expansion and contract on may be, it is sufficient to make a rod of any length sensibly longer in summer than in winter; and, therefore, clocks, with common pendulums, go slower in summer, or in a hot climate, than in winter, or in a cold climate.

If any substance existed, which was not affected by heat or cold, we could easily remedy this defect, as we should only have to make a pendulum-rod of that substance. But no such substance is known; and therefore it might seem at the first view, that to remedy this defect is impossible. This opinion was formerly held by scientific clock-makers; and they therefore thought the best they could do, was, to make their pendulum rods of those substances which are affected *least* by changes of temperature; such as glass and platinum. It has been discovered, however, that by combining different substances in the same pendulum, we can make their various expansions and contractions counteract each other; so that the effective length of the pendulum remains unaltered by heat or cold. Such contrivances are called *compensation-pendulums*; and we will proceed to describe a few of them.

Fig. 12.

This figure represents the lower part of *Graham's mercurial pendulum*. The upper part resembles the common pendulum; but the rod B ends below in a *stirrup*, as represented in the engraving. Upon the *sole*, or lower flat part of the stirrup, is placed a cylindrical vessel of glass, nearly filled with mercury, which by its great weight serves for a bob to the pendulum. Now, in hot weather, the rod B lengthens, and the mass of mercury is therefore lowered, as in a common pendulum; but the mercury also expands, and that in a much greater degree than the glass of which the vessel A is made. The expansion of the mercury, therefore, causes its surface to rise, as in a thermometer. Now if the relative quantity of mercury, in proportion to the length of the rod be observed, the tendency of the expansion of the latter to *lower* the centre of the oscillation will be compensated by the *upward* expansion of the mercury; so that although the bottom or sole of the stirrup be raised and lowered as much as in the common pendulum, yet the centre of oscillation of the mass will be kept in the same place. In order to effect this, the expansion of the mercury *upwards* must be equal to the expansion of the rod *downwards*. Now, although the *length* of the rod is four or five times greater than that of the column of mercury, yet the *expansion* of the two may be equal, because mercury is so much more affected by changes of temperature than steel, the material of which the rod is commonly made.

This is, perhaps, the simplest and most elegant kind of compensation-pendulum; but, owing to the great quantity of mercury, it is very expensive, and therefore accessible only to few persons. Now it is obvious that we might produce the same result, if, instead of the cylindrical vessel A, we had a similar mass of any substance which should be much more easily affected by heat or cold, than the material of the rod. This has been taken advantage of by Mr. Baily, in the construction of a remarkably cheap compensation-pendulum, composed of wood and lead, on the same principle as the mercurial pendulum. No kind of wood was formerly thought applicable to this purpose, because, although it is but slightly affected by changes of temperature, yet the moistness of the atmosphere, by warping it, renders it nearly useless. It has been found, however, that, when a wooden rod is *gilded*, it is rendered nearly insensible to damp, and Captain Kater effected the same purpose by soaking the ends in melted sealing-wax, and giving the rod several coats of copal varnish. The *economical pendulum*, mentioned above, consists of a cylindrical rod of white deal, thus prepared, about forty-six inches long, (for seconds) and a hollow cylinder of cast lead, about 14·3 or 14·4 inches long, serving as a bob, and sliding up and down, supported on a nut, as in the common pendulum. The wooden rod is much less sensible to heat than the lead, and they therefore act in a manner analogous to the steel and mercury in the mercurial pendulum.

It has always been objected to the mercurial pendulum, that the different substances used in its construction do not absorb heat equally. If the temperature of the air be suddenly increased, the steel of the pendulum acquires that additional portion of heat much more rapidly than the glass bottle containing the mercury; consequently the pendulum cannot begin to compensate, until both the metals have acquired the same temperature: and whilst their temperature differs, there is no compensation.

To obviate this defect, a pendulum has been used, which possesses remarkable simplicity. It consists of nothing but a long glass tube, or a long-necked bottle, into which mercury is poured to the height of about five inches, to serve as a bob. The top is then closed by a brass cap, into which the spring is fixed. This is simply a mercurial pendulum, in which the rod and stirrup are of glass; the former being the neck, and the latter the body of the bottle. Now, as the outer surface of this instrument is everywhere equally thick, and of the same material (glass), every part must absorb heat equally; which they do not in the common mercurial pendulum.

We will now describe another very simple and efficient compensation-pendulum, which depends on a different principle from the others. If two bars of different substances, which are not equally affected by heat, be rivetted, or otherwise fixed, together,

there will be only one particular temperature at which they will be equal in length; for, if the temperature be raised above this point, both bars will expand, but that bar which is most sensible to heat will expand most, and will therefore be longer than the other; and if the temperature be lowered, they will both contract, but that which expanded most will also contract most, and will therefore be the shorter of the two. Now, if the two bars be fixed firmly together, so as to form a compound bar, this will only be quite straight as long as the two bars are equal. If one become longer than the other, the compound bar must bend; the shorter bar becoming concave, and the other convex; consequently, a bar of this description will be bent or *warped* in one direction by heat, and in the other by cold. Such a compound bar, made of two flat bars of brass and steel soldered together, is often used in the arts. As the brass expands and contracts more than the steel, the effect of heat is to make the brass side convex, while cold makes it concave; and there is only one particular temperature, at which the bar is straight. When such a bar is used to compensate the expansion and contraction of a common pendulum, it is fixed across the rod of the pendulum horizontally, between the bob and the middle of the pendulum, with the steel side upwards, and two weights are placed on the two ends of the bar. Now, when the pendulum-rod is lengthened by heat, the horizontal rod is warped; so that the two ends with their weights are raised. Thus the centres of gravity and oscillation of the whole mass are raised, which compensates for their being lowered by the expansion of the pendulum-rod. The contrary takes place, when by cold the rod is shortened, but the weights are lowered*.

* For further information on this subject, the reader is referred to Vol. XIV., p. 83, of this *Magazine*, or to Tomlinson's *Manual of Natural Philosophy*, at p. 605, under the article Sun-dial.

OPIUM—OPIUM-EATERS—THE OPIUM-TRADE WITH CHINA.

Besides the various inebriating liquids obtained by fermentation, and whose properties depend chiefly on the spirit of wine which they contain, there is a second class of stimulants whose narcotic properties do not depend upon any conversion of saccharine into spirituous matters. Opium stands at the head of this class of inebriating drugs. The use of opium is nearly universal from Turkey to China, and the enormous quantity consumed in the latter country is an evidence that a taste for this narcotic does not depend on the prohibition of wine to the followers of Mahomed. Even in Mussulman countries the interdict of the Prophet is little regarded by those who can obtain a supply of wine or brandy, and all classes, from the Sultan to the rayah, appear to relish fermented liquors. The use of opium, however, appears to be more in accordance with the habits of the Orientals, little given to social pleasures, and choosing rather to be inebriated alone than in company.—It is needless to investigate whether excess in the use of opium or of fermented liquors is more injurious; it appears, however, that moderation in the use of liquors is more easily observed than in the consumption of opium. Thousands indulge in the moderate use of wine, spirits or beer, for a long time, without ever committing any crimes or any way injuring health. It is different with the use of opium; a moderate dose soon loses its power, and with time the quantity used requires to be progressively augmented until the opium-eater becomes a victim to the abuse of his drug. There are very few individuals who, like the late Mr. Wilberforce, can continue the moderate use of opium during a long life.

Some of the opium-eaters can consume an immense quantity of opium without any immediately fatal consequences. Beaujoir gives an account of a Turkish Effendi, who took every day thirty cups of coffee, smoked sixty pipes of tobacco, and swallowed three drachms of opium, while his solid food consisted of only four ounces of rice. Dr. Jones, in his book, entitled *Mysteries of Opium Unveiled*, assures us that he knew of several persons in England who were in the habit of taking two, three, four, or six drachms daily; and that he heard of one that could take *two ounces in a day*, a quantity not exceeded, perhaps, in the history of man.

Baron de Tott gives a miserable picture of those who frequent the opium-market at Constantinople, describing them as having pale and melancholy countenances, with meagre necks, heads twisted to one side, back-bones distorted, shoulders drawn up to the ears, and other extraordinary appearances. Seated in the twilight of the evening or reclining on sofas in little shops ranged along the walls of the mosque of Solyman, may be seen the infatuated Hereaks, (opium-eaters,) swallowing their opium pills in proportion to the degree of want which habit has rendered necessary. Each poor votary anxiously awaits the agreeable reverie that is to follow as the effect of this indulgence. He soon returns to his home full of an imaginary happiness which neither reason nor the realities of life can procure, and in this manner each successive day witnesses a repetition of the irregularity, till, worn out with debility and intemperance, he at last sinks like a shadow into the grave.

The following anecdote, for which, however, the authority is not given, gives a curious example of the effects of immoderate habits of using opium. An English ambassador, lately sent to a Mahomedan prince, was conducted upon his arrival at the palace through several richly decorated and spacious apartments, crowded with officers arrayed in superb dresses, to a room, small in dimensions, but ornamented with the most costly and splendid furniture. The attendants withdrew. After a short interval two persons of superior mien entered the saloon, followed by state bearers, carrying under a lofty canopy a litter covered with delicate silk and the richest Cashmere shawls, upon which lay a human form, to all appearance dead, except that its head was dangling loosely from side to side as the bearers moved into the room. Two officers, holding rich filagree salvers, carried each a chalice and a vial containing a black fluid. The ambassador considered the spectacle to be connected with some court ceremony of mourning, and endeavoured to retire, but he was soon undeceived by seeing the officers holding up the head of the apparent corpse, and after gently chafing the throat and returning the tongue, which hung from a mouth relaxed and gaping, pouring some black liquor into the throat, and closing the jaws, until it sank down the passage; after six or seven times repeating the ceremony, the figure opened its eyes and shut its mouth voluntarily; it then swallowed a large portion of the black fluid, and within an hour an animated being sat on the couch with blood returning into his lips, and a feeble power of articulation. In the Persian language he addressed his visitor, and enquired the particulars of his mission. Within two hours this extraordinary person became altered, and his mind capable of arduous business. The ambassador, after apologising for the liberty, ventured to inquire into the cause of the scene he had just witnessed.

"Sir," said he, "I am an inveterate opium-taker, and I have by slow degrees fallen into this melancholy excess. But of the diurnal twenty-four periods of time, I continually pass eighteen in this reverie, unable to move or speak; I am yet conscious, and the time passes away amid pleasing fancies, nor should I ever awake from the wanderings of this state had I not the most faithful and attached attendants, whose regard and religious duty impel them to watch my pulse. As soon as my heart begins to falter, and my breathing is imperceptible except on a mirror, they immediately pour the solution of opium into my throat, and restore me as you have seen. Within four hours I shall have swallowed many ounces, and much time will not pass away ere I shall relapse into my ordinary torpor."

The mode of using opium in Turkey and China is a little different. In the former country the practice is to swallow a certain number of opium pills, proportioned to the capacity of the *theriaki*, or opium-eater. In China the opium is boiled in water, and the extract, when dried, is put into a pipe and used as we do tobacco. The employment of this demoralizing drug has grown to an evil of enormous magnitude in China; and we believe few individuals who are moderately acquainted with the circumstances of the case will disapprove of the energy with which the Chinese government have at last insisted on putting down this mischievous traffic, and still fewer who will not entertain feelings of contempt or disgust at the conduct of the East India Company, which profits so largely by this commerce, and is the only power which can effectually put it down.

The conduct of the Company is an instance of elaborate iniquity and hypocrisy. It appears from the *Chinese Repository* for 1837, that throughout all the territories within the Company's jurisdiction, the cultivation of the poppy, the preparation of this drug, and the traffic in it until it is brought to Calcutta, and sold by auction for exportation, are under a strict monopoly. Should an individual undertake the cultivation without having entered into engagements with the government to deliver the produce at the fixed rate, his property would be immediately attached, and the ryot compelled either to destroy his poppies or give security for the faithful delivery of the produce. Nay, according to a late writer, the growing of opium is compulsory on the part of the ryot. Advances are made by the government through its native servants, and if a ryot refuses the advance, the simple plan of throwing the rupees into his house is adopted. Should he attempt to abscond, the peons (police) tie the advance up in his clothes and push him into the house. The business being now settled, there being no remedy, he applies himself as he may to the fulfilment of his contract.

"The great object of the Bengal opium agency," says Dr. Butter, "is to furnish an article suitable to the peculiar tastes of the population of China. During the year 1837 the quantity of opium exported to Canton amounted to 16,916 chests, containing each about 120 lbs., and having a value of upwards of two and a half millions sterling." The amount of misery occasioned by this commerce must be enormous. The cultivation of the drug is almost compulsory on the poor Hindoo. The entire opium crop is smuggled into China, where it proves a poison to millions. The process of smuggling is thus accurately described by a Chinese magistrate:—"Here are constantly anchored seven or eight large ships, in which opium is kept, and are therefore called receiving ships. At Canton there are brokers of the drug, called melters. These pay the price of the drug into the hands of the resident foreigners, who give them orders for the delivery of the opium from the receiving ships. There are carrying boats plying up and down the river, and these are vulgarly called fast crabs and scrambling dragons. They are well armed with guns and other weapons, and are manned with some scores of desperadoes, who ply their oars as if they were wings to fly with. All the custom-houses and military posts which they pass are largely bribed. If they happen to encounter any of the armed cruising boats, they are so audacious as to resist, and slaughter and carnage ensues."

The enormous mischiefs of the opium-trade are sufficiently apparent to the Chinese government, which has the credit of being sincerely desirous of putting a stop to it. The matter has been discussed by the different mandarins in the most deliberate manner, and with a perfect knowledge of all the facts; the evils of smuggling, on the one hand, and of a licensed trade, on the other, are discussed in a manner which would exceed the intellectual capacities of many European statesmen. The more intelligent of the Chinese appear to be of the same opinion with their governors, as to the urgency of the evil, and the necessity of checking so enormous an abuse. Their moralists write against it, and it is the subject of illustration by their artists. In the *Chinese Repository*, there is an account of a series of paintings by a Chinese artist, illustrating the progress of the opium-eater, from health and affluence to poverty and disease; and the idea, and mode of execution, bear a striking resemblance to the Rake's Progress, by Hogarth.

We are sorry to see several attempts to mislead the public by those who appear to be interested in the traffic, and some even propose going to war with the Chinese, for the sake of the opium-trade. It is probable that few right-thinking people will feel any sympathy for the opium-merchants, or will countenance any attempt to bully the unoffending Chinese government into a free trade in this deleterious drug. Were the importation of opium abandoned, it is probable that the real and heavy grievances which the Chinese inflict on the inoffensive portion of the foreign merchants might be at length removed, and certainly they would meet with more sympathy.

Opium, like wine, stands as the type of a class of stimulants, of which many kinds are used as substitutes for the juice of the poppy. The use of various preparations of hemp is common in those countries where opium is taken, and appears in short to be the poor man's opium; the consumers of the two drugs being respectively analogous to the wine-drinkers and whiskey-drinkers of our own country. The most common preparation of hemp goes by the name of *bang*, and is exclusively used in India: its narcotic properties resemble those of opium, but are more stupefying and violent, and less permanent.

We shall only notice two other substitutes for opium, taken from two very remote countries. The Peruvians have been acquainted for a long period with the virtues of a small tree called *coca*, whose leaves possess properties resembling the effects of opium. The leaves of this plant are plucked three or four times a year, and after being carefully dried are packed in small baskets. Many chew these leaves as others do tobacco; and such is the sustenance derived from them that they frequently take no food for four or five days, although constantly working; and while they have a good supply they feel neither hunger, thirst, nor fatigue, and without any injury to health they can remain upwards of a week without the refreshment of sleep. Coca proves to the Peruvian

the highest source of gratification; for under its influence the imagination presents the most fascinating scenes. Many to indulge in its use forsake the rational associations of civilized life, and return in the evening to the woods, to revel in the uninterrupted enjoyment of its magic qualities. Prostrated under a tree, its votary, heedless of the storm, the darkness of the night, or the attacks of wild beasts, reposes happy and contented, until the morning awakes him to a sense of his own degradation, and induces him to return—a frightful picture of unnatural indulgence.

When a Peruvian starts on a journey he carries with him a small leather pouch for holding coca, and a calabash for lime or ashes of the *molle*, to mix with the coca. Thus equipped, a man will undertake to convey intelligence upwards of one hundred leagues without any other provision. These persons are termed *chosques*, or *chosqueros*, a name given to the conductors of mails. Men of this description were employed for the transmission of intelligence by the Incas long prior to the invasion of the Spaniards; and some of these couriers have been known to convey news a distance of six hundred miles in six days. The coca appears to be a kind of American opium, closely resembling the opium of the poppy in its effects, and presenting a most remarkable analogy in its history and uses with that of the Oriental drug.

A mushroom which grows in Siberia, and which is not uncommon in this country, is used as a narcotic in Kamschatka and other parts of the Russian empire. The fungus or mushroom is eaten without any preparation; and two small ones afford a moderate dose. The effects of this exhilarant have more resemblance to the intoxication produced by spirits, than to the sober, dreamy visions induced by opium. Its ordinary effects are giddiness, gaiety, a flushed countenance, and incoherent talking; it renders some very active, and proves highly stimulant to muscular exertion. Too large a dose brings on violent spasmodic affections; and such are its excitements on the nervous system, that it renders many very silly and ludicrous. If a person under its influence wish to step over a straw or small stick, he takes a stretch or jump sufficient to clear the trunk of a tree; a talkative person can neither keep silence nor secrecy; and one fond of music is perpetually singing.

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THE PHILOSOPHY OF A SOAP-BUBBLE.

No. I.

THERE are probably many of our readers, who, on referring back to the period of their childhood or youth, and calling to mind the various toys which beguiled their young hours, have regretted the totally uninstructive tendency of the wooden horse and sword, the squeaking trumpet, and the tinselled drum; and seeing many around them who have attained manhood, in utter ignorance of the tritest principles of science, have lamented such ignorance, and felt the necessity of some scientific knowledge in the general concerns of life.

Does it ever occur to such persons, that, had their toys been machines, or simple instruments employed in the mechanical arts, they would have had a better chance of imbibing a taste for useful pursuits, and of gaining knowledge, than by the use of the unmeaning, ill-constructed and expensive lumber, bearing the name of "toys," which excites delight the first day, indifference the second, and a desire to pry into its internal mechanism on the third, which curiosity generally effects the destruction of the toy? The child whose curiosity prompts it to rip open the drum, in order to see "where the sound comes from," might surely have its curiosity better excited, especially if an intelligent parent would guide its young hands to the use, and its tender mind to the appreciation, of such simple and easily-constructed apparatus and machinery as would inform the mind of valuable truths, stimulate research, and render the play-room of youth its lecture-room, not only without detracting from the cheerfulness and fun of the former, but actually rendering it more delightful, by imparting a new interest in what may still be called toys, but which in fact are toys whose use will be felt and appreciated at every subsequent period of the young pupil's life.

It is our purpose to present the reader with a few occasional articles on the Philosophy of Toys. We select the SOAP-BUBBLE for our commencement, not only on account of the extreme simplicity of this favourite childish toy, but as a most remarkable illustration of the proposition, that it requires a great deal of philosophy to observe common things. Let not the reader smile at our subject, and deem a soap-bubble unworthy his serious attention. The great Newton did not disdain to study phenomena, because they were presented to him by things which we are in the habit of calling mean, childish, and trivial: he availed himself of whatever would assist him in searching after those perfect and immutable laws, by which the Almighty governs the universe; and among other objects he directed especial attention to a SOAP-BUBBLE. We propose therefore to consider, *first*, the phenomena exhibited by soap-bubbles; *secondly*, some other phenomena depending on the same causes, and bearing a strong relation to them; and *thirdly*, we will endeavour to present a popular view of the natural laws which influence the production of these phenomena.

1. OPTICAL PHENOMENA OF A SOAP-BUBBLE.

It is generally known that bubbles of every description, whether formed by shaking a liquid, or by blowing the bubbles with a tobacco-pipe, are thin films of liquid, inflated into a globular shape by air, or some other gaseous body; and that such films, when much distended with air, appear covered with very beautiful colours, resembling those of the rainbow. They depend for this solely on their *thinness*, and these colours are therefore called the *colours of thin plates*; for they are not confined to films of fluids, but very thin plates of any transparent body also exhibit them. The usual globular form of bubbles has nothing to do with these colours, for a plain film will show them as well as a convex surface. Such a film may be formed by dipping the mouth of a wine-glass into a tenacious liquid, when, on taking it out, and holding it horizontally, a flat film will be seen to cover the mouth, which will exhibit various brilliant colours, increasing in beauty as the film becomes thinner, till at length it bursts.

The reasons why the film becomes thinner and thinner, are, *first*, the continued evaporation from its surface, and, *secondly*, the continued draining of its substance, which descends by its gravity to the lowermost part. When a bubble becomes exceedingly thin, the slightest breath, or commotion of the air, is apt to destroy it. This cause of evanescence may be removed, and the duration of the bubble prolonged, by placing it under a convenient glass cover. The length of time during which the bubble remains also depends on the tenacity of the fluid; because the more tenacious or viscid the fluid is, the thinner can its films be made, without bursting. Water is not

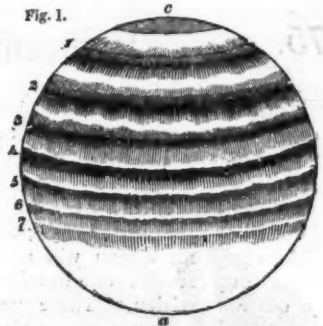
sufficiently viscid; for its bubbles will not hold for any time together, and drain to a sufficient degree of thinness to show colours. The film could not support its own weight at such a degree of thinness; but the tenacity of water may be increased by the addition of soap, to dissolve which the water must be tolerably pure. Soap dissolved in rain-water forms a lather, or solution of soap, which is the most convenient liquid for forming bubbles, and its tenacity may be increased, so as to form still larger and more durable bubbles, by adding to the lather a little isinglass. Still however we have not described the mode of producing a *permanent bubble*, and such a bubble is absolutely necessary, in order to study the phenomena presented by it; for though bubbles formed in the common way may last a considerable time, yet we can never be certain of their remaining more than a few seconds, and they seldom remain quite long enough to exhibit the whole series of tints, as they generally burst at the moment when the most important part of the observation is beginning. The way to produce a permanent bubble, which may remain for a considerable time, is to form it *in vacuo*, and the best apparatus for effecting this may be thus easily prepared.

Take a phial about the size of the apothecary's six ounce phials, or about 1½ inch in diameter. Fill it about one third full of distilled or rain water; immerse it in a vessel of cold water, and place the whole upon the fire till the water both within and without the phial boils, and steam issues from the mouth of the phial, which will not crack unless the fire be very strong. Now, while a jet of steam is rushing out of the phial's mouth throw in a bit of soap about as big as a pea, cork it, and instantly remove the vessel from the fire, otherwise the steam in the phial continuing to be generated, will either blow out the cork or burst the phial. Push in the cork very tight, and melt a thick layer of sealing wax over it; this will prevent air from entering through the pores of the cork. Keep the phial in the hot water, and let it cool gradually, lest the change of temperature should crack the bottle. When cold it is ready for use.

We have now a bottle containing lather, and a vacuum, which, if well made, is more perfect than could be made by the best air-pump. This cheap and simple apparatus, when once prepared, will remain perfect for a long time; and a good thin film can at any time be made by holding the bottle horizontally, and giving it a sudden jerk, by which the liquid will be thrown upwards, and touching the upper interior surface of the phial, will, on returning, leave a flat circular film, or plate, extending quite across the inside of the bottle; and on placing the bottle upright, the film will be nearly, though never quite, horizontal. Perhaps, two or three films will be produced; but these will be of no inconvenience. In order to observe the colours of the film, we must place the bottle close to the window, so as to have the uninterrupted light of the sky reflected from the film; and the bottle must not be touched during the whole observation.

At first, the film will be white, being then too thick to exhibit any colour; and merely reflecting the light; but in a minute or two it will appear much agitated by currents descending from the highest to the lowest part of the film, and thence trickling down the inner surface of the bottle into the mass of liquid below. At the same time, spots of the most gorgeous and exquisite tints will be formed on the surface of the film, which will ascend from various parts towards the crest or highest point, where, collecting together, they will arrange themselves into seven coloured arches, or little concentric bows, which will dilate and expand till they almost cover the surface of the film, which will then present the appearance of the following figure.

Fig. 1.



1st arch:—black, white, yellow, orange, red.
2nd arch:—purple, blue, white, yellow, red.
3rd arch:—purple, blue, green, white, red.
4th arch:—purple, blue, green, white, red.
5th arch:—greenish blue, pale red.
6th arch:—pale sea green, pink.
7th arch:—very pale green, reddish white.

The space beyond this is white, being too thick to appear coloured; but as the requisite thinness extends downwards over the film, which becomes thinner by draining, the arches enlarge, and, as it were, push each other forward from *c* towards *a*, till the seventh arch disappears at *a*, as if it went out of the bottle. The film is then completely covered with colours; but has only six arches. As these advance towards *a*, expanding as they advance, the sixth arch also vanishes, as if it had been pushed out by the enlargement of the others. Then the fifth follows, and so on, till the first arch only remains, occupying the whole surface of the film, which is then divided into five broad bands, black, white, yellow, orange, and red. Of these, the red first vanishes at *a*; then the orange; and then the yellow; so that the film is at length divided into two nearly equal portions, black and white.

The colours described above are of the most gorgeous description, such as no art can imitate; for they are sketched by the pencil of nature, and the eye lingers over them with delight. Although, in the table, the same name, such as *red, purple*, &c., is repeated several times, yet there are in fact no two colours alike; but each red, each purple, &c., possesses a character peculiar to itself. All the colours melt gradually into each other, except the black and white, which are separated by a distinct and well defined line. The different colours of the first, second and third arches, which are always the most brilliant, are, of course, most distinctly seen towards the close of the observation, when they expand into broad stripes, while at the beginning they are too close together to be well observed. It should be stated that the *black* is the extreme of thinness; and that each colour corresponds with a particular thickness, as we shall hereafter endeavour to prove.

The whole time taken up by the process described above is from twenty minutes to an hour; after which the black space continually enlarges, till the film is too thin to support itself. Its whole duration is sometimes as much as 24 hours; at the end of which period the film represents somewhat the appearance of a new moon, for the black part greatly exceeds the white one. The slightest disturbance of the bottle, however, destroys it.

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